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10/658,982	09/10/2003	Clark Edward Lubbers	STL11421	3967

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Fellers, Snider, Blankenship,
Bailey & Tippens, P.C.
Suite 1700
100 North Broadway
Oklahoma City, OK 73102-8820

EXAMINER	
FLOURNOY, HORACE L	

ART UNIT	PAPER NUMBER
2189	

DATE MAILED: 09/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/658,982	LUBBERS ET AL.	
	Examiner	Art Unit	
	Horace L. Flournoy	2189	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 April 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-9,16-19,21-23 and 25-33* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-9,16-19,21-23 and 25-33* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 April 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This Office action has been issued in response to amendment filed 13 April 2006. Claims 1-33 are pending. Applicant's arguments have been carefully and respectfully considered, and are persuasive. Furthermore, new grounds for rejection have been set forth. Accordingly, this action has been made NON-FINAL.

REJECTIONS BASED ON PRIOR ART

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-2, 16, and 29-33 are rejected under 35 U.S.C. 102(e) as being anticipated by **Nanda et al. (U.S. PG Pub No. 2004/0059876) hereafter referred to as Nanda.**

With respect to **independent claims 1, 16, and 29**,

"A method of maintaining a directory for a data container **[Nanda discloses this limitation in the abstract, lines 1-8]** *comprising: determining that a sparse directory structure is to be changed;* **[Nanda discloses this limitation, e.g. in paragraph [0017], lines 1-13]** *and reconstructing said sparse directory structure into a fully populated directory structure."* **[Nanda discloses this limitation, e.g. in paragraph [0032], lines 11-12]**

With respect to **claims 2 (and 32-33),**

"The method of claim 1 further comprising: determining that said fully populated directory structure is to be changed; **[Nanda discloses this limitation, e.g. in paragraph [0032], lines 11-12]** *and reconstructing said fully populated directory structure into a sparsely populated directory structure."* **[Nanda discloses this limitation, e.g. in paragraph [0017], lines 1-13]**

With respect to **claim 30,**

[Nanda discloses the limitations of this claim, e.g. in paragraph [0032], lines 11-12]

With respect to **claim 31,**

[Nanda discloses the limitations of this claim, e.g. in paragraph [0005], lines 12-16]

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere* CO., 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 3-5, 7-9, 17-19, 21-23, and 25-28 are rejected under 35 U.S.C. 103(a) as being obvious over Nanda et al. (U.S. PG Pub No. 2004/0059876) in view of Abrashkevich et al. (U.S. PG Pub No. 2004/0221120 hereafter referred to as Abrashkevich)

Nanda teaches the limitations of claims **1-2, 16, and 29-33**.

Nanda, however, does not disclose *expressly (the limitations found in claims **3-5, 7-9, 17-19, 21-23, and 25-28**) e.g.*: top level lists, skip lists, linked lists, etc.

Abrashkevich discloses the limitations found in *claims 3-5, 7-9, 17-19, 21-23, and 25-28*:

Nanda and Abrashkevich are analogous art because they are from the same field of endeavor, that being memory management.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine sparse and full directory management methods with various list and array types, etc.

The *motivation* for doing so would have been obvious based on the teaching of Abrashkevich in abstract, lines 3-7.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention having the teachings of Abrashkevich and Nanda before him/her to combine Nanda and Abrashkevich for the benefit of having sparse and full directory management methods with various list and array types, etc.

With respect to **claims 3 and 17,**

> *"The method of claim 1 wherein said sparse directory structure* **[paragraph [0002], "...freeing... deallocating, and defragmenting available memory space within a memory storage heap..."]** *comprises: a plurality of first directory entries comprising an address to one of said addressable spaces,* **[paragraph [0027], "In a preferred embodiment, memory chunks are allocated from the end of the heap or pool (higher memory address) toward its header which is located (see FIG. 2) at the beginning of the heap or pool (lower memory address)."]** *a descriptor,* **[paragraph [0022], "attribute sets"]** *and at least one link, said link being a pointer* **[paragraph [0003]]***to a different of said directory entries;* **[paragraph [0003], "linked list"]** *at least one bottom level*

list **[Abrashkevich discloses in paragraph [0025], "When only one (the lowest) link level..."]** *comprising at least one of said plurality of first directory entries; at least one top level entry for each of said bottom level lists; and a top level list* **[paragraph [0034], "maxlevel"]** *comprising said top level entries."* **[paragraph [0027], "In a preferred embodiment, memory chunks are allocated from the end of the heap or pool (higher memory address) toward its header which is located (see FIG. 2) at the beginning of the heap or pool (lower memory address)."]**

With respect to **claims 4 and 22,**

"The method of claim 3 wherein said top level list **[paragraph [0034], "maxlevel"]** *is a skip list."* **[Abrashkevich discloses in paragraph [0025], "...the skip list becomes a well-known linked list."] [paragraph [0027], "In a preferred embodiment, memory chunks are allocated from the end of the heap or pool (higher memory address) toward its header which is located (see FIG. 2) at the beginning of the heap or pool (lower memory address)."]**

With respect to **claims 5 and 23,**

"The method of claim 3 wherein said top level list **[paragraph [0034], "maxlevel"]** *is a linked list."* **[Abrashkevich discloses in paragraph [0025], "... the skip list becomes a well-known linked list."]**

With respect to **claims 6 and 24,**

"The method of claim 3 wherein said top level list **[paragraph 0034, "maxlevel"]** *is a doubly linked list."* **[Abrashkevich discloses in paragraph [0031], "...skip lists become the usual doubly linked lists.]**

With respect to **claims 7 and 25,**

"The method of claim 3 wherein said top level list **[paragraph 0034, "maxlevel"]** *is an ordered array."* **[paragraph [0030], "...allocated memory chunks are ordered by their offsets in ascending order."]**

With respect to **claims 8 and 18,**

"The method of claim 3 wherein said bottom level lists are skip lists." **[Abrashkevich discloses in paragraph [0025], "When only one (the lowest) link level is used for all nodes in a list, the skip list becomes a well-known linked list."]**

With respect to **claims 9 and 19,**

"The method of claim 3 wherein said bottom level lists are linked lists." **[Abrashkevich discloses in paragraph [0025], "When only one (the lowest) link level is used for all nodes in a list, the skip list becomes a well-known linked list."]**

With respect to **claims 10 and 20,**

"The method of claim 3 wherein said bottom level lists are doubly linked lists." **[Abrashkevich discloses in paragraph [0031], "...skip lists become the usual doubly linked lists.]**

With respect to **claims 11 and 21,**

"The method of claim 3 wherein said bottom level lists are ordered arrays." **[paragraph [0030], "...allocated memory chunks are ordered by their offsets in ascending order."]**

With respect to independent **claim 16,**

"A data storage system comprising: a data storage container; **[Abrashkevich discloses in the abstract, "A data structure, method and system are provided incorporating a general purpose memory allocator and defensive heap memory manager."]** *and a controller that defines a sparse directory structure for said data container, determines that said sparse directory structure is to be changed, and reconstructs said sparse directory structure into a fully populated directory structure."* **[paragraph [0002], "A dynamic memory manager handles computer memory requests for allocating, freeing, reallocating, deallocating, and defragmenting available memory space within a memory storage heap..."]**

With respect to **claim 26,**

"The method of claim 1, wherein the sparse directory structure of the determining step is formed by steps comprising: creating a first directory entry comprising a first address, and a first forward link; **[paragraph [0007], "...allocating a primary allocation of memory and a primary data structure associated with the primary allocation of memory, the primary data structure containing attributes describing the primary allocation of memory."** *creating a second directory entry comprising a second address, and a second forward link;* **[paragraph [0007], "...Further means for allocating a secondary allocation of memory associated with and pointed to by the primary allocation of memory, the secondary allocation of memory associated with a secondary data structure containing attributes describing the secondary allocation of memory."]** *determining that said second directory entry is located after said first directory entry in said data container;* **[paragraph [0006]]** *defining said first forward link to link to said second directory entry;* **[paragraph [0003], "...links to the left/right neighbors, etc.)" See paragraphs [0025] – [0030]]** *creating a bottom level list that comprises said first directory entry and said second directory entry; creating a top level entry that comprises a link to said bottom level list,* **[Abrashkevich discloses in the paragraph [0031], "to coalesce free chunks in constant time just by reconnecting the relevant links in both directions"]** *a lower range, and an upper range;* **[See paragraphs [0025] – [0030]]** *analyzing said bottom level list to determine said lower range and said upper range of said top level entry; and creating a top level directory that comprises said top level entry."* **[paragraph [0027], "In a preferred embodiment, memory chunks are allocated from the end of the heap or pool (higher memory address) toward**

its header which is located (see FIG. 2) at the beginning of the heap or pool (lower memory address)."]

With respect to **claim 27,**

"The method of claim 26 wherein said first directory entry comprises a first backward link and said second directory comprises a second backward link, **[Abrashkevich discloses in the paragraph [0031], "to coalesce free chunks in constant time just by reconnecting the relevant links in both directions"]** *the method further comprising: determining that said first directory entry is located before said second directory entry in said data container;* **[paragraph [0006]]** *and defining said second backward link to link to said first directory entry."* **[paragraph [0003], "...links to the left/right neighbors, etc.)" See paragraphs [0025] – [0030]]**

With respect to **claim 28,**

"The method of claim 26 further comprising: creating a third directory entry comprising a third address, and a third forward link, **[paragraph [0007], "Additional means for allocating a tertiary allocation of memory associated with and pointed to by the secondary allocation of memory, the tertiary allocation of memory associated with a tertiary data structure containing attributes describing the tertiary allocation of memory."]** *said third address being between said first directory entry and said second directory entry; and adding said third directory entry by steps comprising: adding said third directory entry to said bottom level list;* **[paragraph [0031], "...one set of links connects**

the current node to the corresponding next and previous nodes from the skip list sequence sorted by offset and the other set of links connects the current node to the corresponding next and previous nodes from another sequence of nodes..." Note: the examiner interprets a next node or previous node as analogous to any combination of 1st, 2nd, 3rd, etc. nodes or directory entries.] *determining that said third directory entry is located between said first directory entry and said second directory entry; and changing said first forward link to link to said third directory entry;* **[paragraph [0007]]** *and defining said third forward link to link to said second directory entry."* **[Abrashkevich discloses in the paragraph [0031], "to coalesce free chunks in constant time just by reconnecting the relevant links in both directions"]**

Response to Arguments

Applicant's arguments with respect to claims 1 and 16 have been considered but are moot in view of the new ground(s) of rejection.

CONCLUSION

Direction of Future Correspondences

Any inquiry concerning this communication or earlier communication from the examiner should be directed to Horace L. Flournoy whose telephone number is (571) 272-2705. The examiner can normally be reached on Monday through Friday 8:00 AM to 5:30 PM (ET).

Important Note

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Reginald G. Bragdon can be reached on (571) 272-4204. The fax phone numbers for the organization where this application or proceeding is assigned is (703) 746-7239.

Information regarding the status of an Application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or PUBLIC PAIR. Status information for unpublished applications is available through Private Pair only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (571) 272-2100.

Horace L. Flournoy

Patent Examiner
Art unit: 2189

Reginald G. Bragdon

Supervisory Patent Examiner
Technology Center 2100